INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

24 April 2014 (pm)

Subject ST9 – Enterprise Risk Management

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all four questions, beginning your answer to each question on a new page.*
6. *Candidates should show calculations where this is appropriate.*

Graph paper is required for this paper.

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Everyman Investments is an online stockbroker which has grown and established itself successfully in recent years. Part of its success is attributed to its dynamic founder and his small but flexible management team.

The company is currently preparing for an initial public offering of its shares, which will lead to the eventual retirement of its founder. Everyman Investments wants to convince investors that it has the structures in place to ensure continued growth after his departure.

(i) Describe the "key man" risks arising from the proposed retirement. [2]

(ii) Outline how these risks could be mitigated. [5]
[Total 7]

2 General Conglomerate (GC) is a large manufacturing company with operations across the world. As part of its benefits package, it provides all managerial grade employees with access to a company car. The cars are owned by GC Leasing, a group subsidiary, and leased to employees at preferential rates. GC Leasing in turn has set up a captive insurer, GC Insurance, to provide insurance to its fleet of motor cars. GC Insurance may purchase reinsurance to mitigate its exposure.

(i) Suggest financial management advantages of setting up a group captive insurer in this way. [2]

(ii) Describe the likely insurance risk profile of GC Insurance. [2]

GC Insurance is regulated as an insurance company. Its regulator is proposing to adopt new regulations, under which there will be no distinction between open market and captive insurers.

(iii) Comment on the appropriateness of this proposal. [2]
[Total 6]

3 In order for retail banks to be profitable, they will generally have to accept short term deposits and invest the proceeds in longer term and less liquid assets. In order to be as profitable as other companies in a competitive environment, they will seek to keep equity capital as low as possible. Furthermore, many governments in the world seek to protect retail deposits through a combination of legislation, regulation and compensation schemes.

(i) Describe the main risks that a retail bank will be carrying in its asset-liability management program. [6]

A loan to deposit ratio (LDR) is the ratio of a bank's nominal loan book to its deposits.

A liquidity coverage ratio (LCR) is the ratio of a bank's high quality liquid assets to its 30-day stressed net cash outflows. Stressed net cash outflows are substantially higher than normal net cash outflows.

A net stable funding ratio (NSFR) is the ratio of a bank's stable funding to its weighted long term assets. Stable funding includes equity, customer deposits and long term wholesale funding. Long term assets includes all loans with maturities longer than one year, a percentage of loans with less than one year to maturity and a percentage of government and corporate bonds.

Two banks operate with the following ratios:

	Bank A	*Bank B*
LDR	200%	90%
LCR	100%	85%
NSFR	60%	110%

(ii) Explain the risks that the banks are carrying given these ratios. [6]

Basel III will likely introduce a minimum LCR requirement of 100% and a minimum NSFR requirement of 100%.

(iii) Outline the steps that banks should undertake to optimise their funding mix, given these upcoming requirements. [3]
[Total 15]

4 Abe's Cola Company (ACC) was established by Abe and his friends in a small town in the USA in the 1970s. Abe and his friends' core values then and now are:

- To produce and serve tasty food and drink using 100% natural ingredients at a fair price.

- To care for the environment.

- To trade fairly with everyone.

ACC has been extremely successful over the years. It is now a large food and soft drinks company listed on a major exchange. It owns worldwide recognised brands. It manufactures and distributes food and drink and operates restaurants and small food stores across several different continents. The four main subsidiaries are:

- Brands, Franchising and Marketing.
- Drink Distribution.
- Confectionery and Food Snacks.
- Family Restaurants.

The main subsidiaries are operated on an arm's-length basis with separate employees. All of the consolidation of the businesses is carried out at the group level. The subsidiary Chief Executive Officers (CEOs) report in to Abe, who is the group Chairman, President and CEO. The only other group employees are the group Chief Financial Officer (CFO), the group Legal Counsel and the group Head of Mergers and Acquisitions. The group board comprises Abe, the three other group personnel and the four CEOs of the main subsidiaries.

Abe and his company are viewed quite fondly by both the shareholders and the lending banks. Abe is seen as being a passionate chef and environmentalist. The company is viewed as being his family company. As it has a long track record of consistent growth, profits and dividends, shareholders and banks are willing to accept the very secretive nature of the company and its unwillingness to provide detailed financial information in its accounts.

The tables below show:

- numbers extracted from the most recent consolidated balance sheet.
- the most recent annual revenues and costs for each subsidiary.

Abe's Cola Company
Consolidated Balance Sheet Extract
In $ millions

Assets

Brands and secret ingredient	3,000
Property (mainly restaurants)	2,000
Plant and equipment	2,000
Trade debtors	400
Cash	100

Liabilities

Long term bank debt	2,000
Short term bank debt	3,000
Trade creditors	100
Shareholders' funds	2,400

Abe's Cola Company
Revenues and Costs by Subsidiary
In $ millions

Brands, Franchising and Marketing	
Annual Revenues	900
Annual Costs	
Marketing expenses	250
Franchising administration	50
Other sundry expenses (with receipts)	100
Other sundry expenses (no receipts)	25
Employees	25
Annual Profit	450

Confectionery and Food Snacks	
Annual Revenues	725
Annual Costs	
Ingredients	300
Packaging and distribution costs	100
Production line annualised capital cost	150
Other sundry expenses (with receipts)	50
Other sundry expenses (no receipts)	-
Employees	25
Annual Profit	100

Drink Distribution	
Annual Revenues	1,150
Annual Costs	
Ingredients including the costs of bottles, cans and kegs	200
Packaging and distribution costs	250
Licensing	400
Production line annualised capital cost	150
Other sundry expenses (with receipts)	50
Other sundry expenses (no receipts)	-
Employees	50
Annual Profit	50

Family Restaurants	
Annual Revenues	700
Annual Costs	
Ingredients	100
Rent	100
Kitchen and furniture annualised capital cost	100
Other sundry expenses (with receipts)	100
Other sundry expenses (no receipts)	-
Employees	200
Annual Profit	100

(i) Describe the key risks that ACC is carrying. [Your answer should include reference to both the narrative description of ACC and the numbers in the tables.] [13]

(ii) Explain why ACC would be extremely interested in long range weather forecasts and the prediction of floods. [2]

ACC has established a small team of weather derivatives traders in its Brands, Franchising and Marketing Division. The team trades derivatives for the Drink Distribution subsidiary at its request. To help to motivate the team to trade at the best prices, the manager has allowed the team to build a book of speculative trades. The team reports the following statistics on a monthly basis to the manager:

- The total premiums paid on derivatives purchased and the total premiums received on derivatives sold.

- The total net sums received/paid on triggered derivatives.

The team receives a percentage of the net profit, being the premiums received plus the sums received less the premiums paid less the sums paid. The amount paid to the team at the end of each financial year increases as the net profit increases and cannot be less than zero.

The manager reports the net profit to the group CFO on a quarterly basis.

(iii) Describe the risks that ACC is carrying as a result of these operating arrangements. [Your answer should **not** include the risks associated with trading in derivatives.] [4]

(iv) Suggest ways in which these risks could be mitigated, transferred or removed. [3]

The team has collected the following information regarding flood levels in an area that provides water to one of the drink production companies:

Flood Data in Consecutive Year Order				*Flood Data sorted from High to Low*	
Year		*Year*			
1	42,000	31	22,600	230,000	59,200
2	102,000	32	8,860	203,000	58,600
3	118,000	33	20,300	185,000	55,700
4	81,000	34	58,600	185,000	54,800
5	128,000	35	85,400	152,000	54,400
6	230,000	36	19,200	140,000	46,400
7	16,300	37	185,000	135,000	45,600
8	140,000	38	8,080	128,000	42,400
9	31,000	39	152,000	122,000	42,400
10	75,400	40	84,200	118,000	42,000
11	16,400	41	110,000	113,000	36,700
12	16,800	42	108,000	110,000	36,400
13	122,000	43	24,900	108,000	34,500
14	81,400	44	60,100	102,000	31,000
15	42,400	45	54,400	102,000	28,200
16	80,400	46	45,600	94,000	24,900
17	28,200	47	36,700	92,100	23,400
18	65,900	48	16,800	92,000	22,600
19	23,400	49	46,400	85,400	22,400
20	62,300	50	92,100	84,200	20,300
21	36,400	51	59,200	83,100	19,200
22	22,400	52	113,000	81,400	16,800
23	42,400	53	54,800	81,000	16,800
24	64,300	54	13,000	80,400	16,400
25	55,700	55	203,000	80,100	16,300
26	94,000	56	83,100	75,400	14,000
27	185,000	57	102,000	65,900	13,000
28	14,000	58	34,500	64,300	11,600
29	80,100	59	135,000	62,300	8,860
30	11,600	60	92,000	60,100	8,080

(v) (a) Outline two possible approaches to fitting a distribution to extreme values, using a different probability density function for each.

(b) Plot these approaches for the flood level data on two probability density function charts, including for each a sketched fitted curve. [Hint: For one approach consider blocks of five years.]

(c) Compare and contrast the two approaches.

(d) State the circumstances under which the shape parameter of the two fitted probability density functions would be expected to be nearly the same.

[13]

(vi) Discuss whether the team should use the flood data to price rainfall derivatives in the given area. [2]

(vii) Discuss whether an extreme value approach should be used to measure and price the number of days in the summer with a temperature in excess of 80 degrees Fahrenheit (27 degrees Celsius) in a given area. [2]

At the end of each calendar quarter, Abe meets with his group Head of Mergers and Acquisitions to discuss business ideas that are in line with ACC's core values. At a recent meeting they discussed the following business ideas:

1. Country X has approximately 100 million people. The vast majority of the people live off the land (subsistence agriculture) and are extremely poor. The country has suffered under the rule of a harsh dictator for the past 25 years. The dictator has recently been overthrown and the fledgling government is encouraging foreign investors to invest in the country and in particular its natural resources, which include land suitable for farming cacao, coffee, maize, wheat and rice. It is suggested that ACC builds a drink distribution plant and a snack foods factory, and opens up a number of small kiosk-style restaurants in the main towns and cities.

2. Purchase a large health foods manufacturer based in the USA. Its main products are a wide range of food bars and vitamin drinks.

3. Purchase a number of micro-breweries with the aim of manufacturing some of their beers in bulk and marketing them through the soft drink distribution subsidiary.

(viii) Compare and contrast the main risks that ACC would carry during the early years of implementing each business idea. [11]

(ix) State with reasons which, if any, business ideas should be pursued by ACC. [3]

ACC does not currently operate any formal enterprise risk management (ERM) process or framework.

(x) Recommend, with reasons, an appropriate ERM framework and governance structure for ACC. [16]

(xi) Describe the changes that should be made to the recommended ERM framework if ACC decided to replace some of its bank debt with rated bonds listed on a major stock exchange. [3]

[Total 72]

END OF PAPER